

NOVELTY OF THE INVENTIONCLAIMS

5 1. - A combined system for the elimination of pollutants from gaseous effluents of the type that comprises means for carrying out at least one electronic bombardment operation and means for carrying out at least one electrostatic interaction operation, characterized in that it includes means for carrying out a heat diffusion and molecular destabilization operation prior to performing the electronic bombardment operation, said heat diffusion and molecular destabilization operation consisting of  
10 restricting the flow of gases in such a way that it causes the gas molecules and the suspended particles thereof to tend to split up and electronically destabilize at the time the temperature of the same gases decreases; and, includes means for carrying out a magnetic molecular rearrangement prior to the electrostatic interaction operation, said magnetic molecular rearrangement operation consisting of subjecting the gases to a magnetic field having such a strength that it achieves a rearrangement of the sub-particles and heavier molecules, and therefore, a selective separation that prepares the gas stream for the electrostatic interaction operation.

20 2. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 1, further characterized in that the means for carrying out the electronic bombardment operation use such current intensities and voltages that they provide enough energy for the formation of chemical bonds, inclusively ionic, between the gaseous molecules, thus allowing the condensation or precipitation of compounds that are separated from the gaseous stream.

25 3. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 1, further characterized in that the means for carrying out the heat diffusion and molecular destabilization operation produce a temperature decrease in the gaseous effluent within an approximated range of 30 to 50°C and generate a turbulent flow with a Reynolds number of approximately  $10^{-12}$  to 1.

30 4. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 2, further characterized in that the means for carrying out the electronic bombardment operation use electrical direct current with voltage within the range of 500 to 80000 Volts, approximately, and an approximate current intensity of 2  $\mu$ A to 2A.

35 5. -A combined system for the elimination of pollutants from gaseous effluents, according to claim 1, further characterized in that the means for carrying out the

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magnetic molecular rearrangement operation generate a magnetic field of 0.5 to 3 militeslas.

6. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 1, further characterized in that the system eliminates approximately between 60% and 96% of the present hydrocarbons and non-aromatic compounds.

7. - A combined system for the elimination of pollutants from gaseous effluents, of the type that comprises means for carrying out at least one electronic bombardment operation and means for carrying out at least one electrostatic interaction operation, characterized by including means for carrying out a heat diffusion and molecular destabilization operation prior to performing the electronic bombardment operation, said molecular destabilization operation consisting of a gas flow restriction in such a way that it causes the gas molecules and the particles suspended thereof to tend to split up and electronically destabilize at the time the temperature of the same gases decreases.

8. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 7, further characterized in that the means for carrying out the electronic bombardment operation use such current intensities and voltages that they provide enough energy for the formation of chemical bonds, inclusively ionic, between the gaseous molecules, thus allowing the condensation or precipitation of compounds that are separated from the gaseous stream.

9. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 7, further characterized in that the means for carrying out the heat diffusion and molecular destabilization operation causes a temperature decrease in the gaseous effluent within an approximate range of 30 to 50°C and generate a turbulent flow with a Reynolds number of approximately  $10^{-12}$  to 1.

10. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 8, further characterized in that the means for carrying out the electronic bombardment operation use electrical direct current with a voltage within the range of 500 to 80000 Volts, approximately, and an approximate current intensity of 2μA to 2A.

11. - A combined system for the elimination of pollutants from gaseous effluents, of the type that comprises means for carrying out at least one electronic bombardment operation and means for carrying out at least one electrostatic interaction operation, characterized by including means for carrying out a magnetic molecular rearrangement prior to the means for carrying out each electrostatic interaction operation,

said magnetic molecular rearrangement operation consisting of subjecting the gases to a magnetic field having a force such that a rearrangement of the sub-particles and heavier molecules is achieved, thus achieving a selective separation that prepares the gaseous stream for the electrostatic interaction operation.

5 12. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 11, further characterized in that the means for carrying out the electronic bombardment operation use such current intensities and voltages that they provide enough energy for the formation of chemical bonds, including ionic, between the gaseous molecules, thus allowing the condensation or precipitation of compounds that are  
10 separated from the gaseous stream.

13. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 12, further characterized in that the means for carrying out the electronic bombardment operation use electrical direct current with a voltage within the range of 500 to 80000 Volts, approximately, and an approximate current intensity of  
15 2 $\mu$ A to 2A.

14. - A combined system for the elimination of pollutants from gaseous effluents, according to claim 11, further characterized in that the means for carrying out the magnetic molecular rearrangement operation generate a magnetic field of 0.5 to 3  
20 militeslas.

20 15. - An apparatus for eliminating pollutants from gaseous effluents of the type that comprises at least one electronic bombardment module and at least one electrostatic interaction module, characterized by including additionally a heat diffusion and molecular destabilization module through which gaseous effluent is passed in a first term; and, a magnetic molecular rearrangement module coupled to at least one  
25 electrostatic interaction module.

16. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 15, further characterized in that it includes a gas supplying module for generating a positive pressure.

17. - An apparatus for eliminating pollutants from gaseous effluents,  
30 according to claim 16, further characterized in that the gas supplying module is a blower including an impeller having a plurality of vanes, which is coupled to motor means.

18. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 17, further characterized in that the motor means are an electric engine.

35 19. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 16, further characterized in that the gas supplying module includes

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control means for adjusting the volumetric flow of the gases to an adequate value for the treatment of the same.

20. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 15, further characterized in that the heat diffusion and molecular destabilization module comprises a plurality of micro-tubes that are inside a duct.

21. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 20, further characterized in that the duct includes 3 sections of micro-tubes.

22. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 20, further characterized in that the micro-tubes have an internal diameter of 0.5 to 5 mm, approximately.

23. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 20, further characterized in that the duct has a circular transversal section.

24. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 20, further characterized in that the heat diffusion and molecular destabilization module includes first coupling means and second coupling means to allow the union of said module with the gas supplying module and with the electronic bombardment module.

25. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 15, further characterized in that the electronic bombardment module is formed by a plurality of hermetic adjoining chambers serially interconnected by means of a plurality of flow restriction means that in addition to generate a better distribution of the gases in each chamber, direct the gas flow in a way that the least space is required for the passage of the gases through as more chambers as possible, such chambers having dimensions depending upon the volumetric flow of the gaseous stream and including at least a pair of electronic bombardment elements.

26. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 25, further characterized in that the dimensions of the chambers are such that allow a residence time of the gases in each chamber within the range of 0.3 to 10 seconds, approximately.

27. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 25, further characterized in that the electronic bombardment elements are found electrically connected to an electrical direct current source which provides a voltage within the range of 500 to 80000 Volts, approximately, and current intensity of approximately 2 $\mu$ A to 2A.

28. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 25, further characterized in that an alternate current to direct current rectifier is used to provide enough electrical energy for the performance of the electronic bombardment module.

5           29. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 25, further characterized in that the electronic bombardment elements are produced from materials selected preferably from cooper, gold, nickel, tungsten, silver, wolframium, platinum, palladium, stainless steel, and combinations and/or alloys thereof.

10           30. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 25, further characterized in that the chamber that receives the gases coming from the heat diffusion and molecular destabilization module includes a gas inlet orifice to the electronic bombardment module, while the last chamber includes a gas outlet orifice, said orifices being respectively coupled to assembly means for allowing the interconnection of the electronic bombardment module with the heat diffusion and molecular destabilizing and magnetic molecular rearrangement modules.

15           31. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 25, further characterized in that the flow restriction means are selected from orifices and valves.

20           32. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 31, further characterized in that the flow restriction means are check valves.

25           33. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 25, further characterized in that the collocation of the chambers as well as of the electronic bombardment elements is defined in such a way that the formation of voltaic arcs or circuit breakdowns is avoided, maintaining a geometry that allows the generation of an adequate electronic bombardment atmosphere.

30           34. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 15, further characterized in that the magnetic molecular rearrangement module comprises a duct and magnetic field generating electromagnetic means.

35           35. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 34, further characterized in that the duct has a circular transversal section and includes a plurality of coils so as to form a plurality of solenoid type electromagnetic arrangements by the unit duct-coils, said coils having a distance between them equivalent to the internal diameter of the duct.

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36. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 35, further characterized in that the electrical energy supplied to the duct-coils arrangement is such that there is formed a positive (south) magnetic pole in the magnetic molecular module side that is interconnected to the electronic bombardment module, while in the side interconnected to the electrostatic interaction module, a negative (north) magnetic pole is formed.

37. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 34, further characterized in that the magnetic molecular rearrangement module further includes an electrical current source that provides the electrical current needed for generating a magnetic field of 0.5 to 3 militeslas.

38. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 15, further characterized in that the electrostatic interaction module comprises an electrostatic filter; first coupling means and second coupling means.

39. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 38, further characterized in that the electrostatic filter comprises a pair of electrically charged filters with respectively opposite charges, between which there a mechanical filter is found.

40. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 39, further characterized in that the pair of electrically charged filters have mesh sizes of approximately 5 to 50 microns.

41. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 40, further characterized in that the pair of electrically charged filters have mesh sizes of 10 microns.

42. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 39, further characterized in that the mechanical filter has a mesh size of approximately 95% to 98% less than the mesh of the pair of filters of steel mesh.

43. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 39, further characterized in that the filters are made of steel.

44. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 38, further characterized in that the first coupling means allow the connection of the electrostatic interaction module with the magnetic molecular rearrangement module, isolating both to avoid any electrical interference, while the second coupling means allow the union of the electrostatic interaction module with the gas expulsion module.

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45. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 44, further characterized in that the first and second coupling means have a design allowing an easy removal of the electrostatic filter.

5 46. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 38, further characterized in that the electrostatic interaction module further includes an electrical current source that provides the electrical current needed for generating a positive charge of +5 to +50 kV, approximately, as well as a negative charge of -5 to -50 kV, approximately.

10 47. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 46, further characterized in that the electrical current source provides the electrical current needed for generating a positive charge of approximately +25, as well as a negative charge of approximately -15 kV.

15 48. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 15, further characterized in that the gas expulsion module is a blower including an impeller having a plurality of vanes which is coupled to motor means, said blower being preferably contained in a rectangular chamber.

49. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 48, further characterized in that the motor means are an electric engine.

20 50. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 48, further characterized in that the gas supplying module includes control means for adjusting the volumetric flow of the gases to an adequate value for the treatment of the same.

25 51. - An apparatus for eliminating pollutants from gaseous effluents, according to claim 15, further characterized in that the treated gases discharged from the gas expulsion module are again taken into an apparatus not including the heat dispersion and molecular destabilizing module, because of which the gas expulsion module includes coupling means.

30 52. - An apparatus for eliminating pollutants from gaseous effluents, according to claims 19, 28 or 36 further characterized in that each of the electrical current sources of the device modules includes computer control and various electric and electronic circuits for protection in order to achieve a performance of the type considered as intrinsically safe.

35 53. - An apparatus for eliminating pollutants from gaseous effluents, according to claims 27, 37 and 46 further characterized in that the same electrical current source is used for supplying the electrical energy to the apparatus modules that require it.

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